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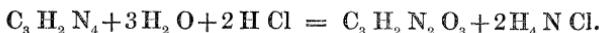
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of cyanogen upon *cyanamide* might have yielded the compound



which, by acids, should have been converted into parabanic acid,



Cyanamide is, in fact, capable of fixing the elements of cyanogen, being converted into a yellowish amorphous powder, which, when heated with acids, furnishes a beautiful crystalline compound, difficultly soluble in water, and deposited from the boiling solution on cooling in long slender needles.

Cyanamide being very prone to molecular changes, when submitted to the action of chemical agents, I have not yet been able to procure a sufficient quantity of these crystals for a more minute examination. In their properties they entirely differ from parabanic acid.

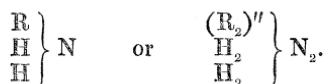
XII. "Notes of Researches on the Poly-Ammonias."—No. XIV.

Diagnosis of Diamines. By A. W. HOFMANN, LL.D., F.R.S. Received May 24, 1861.

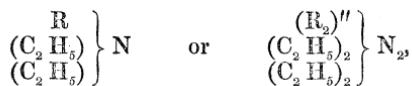
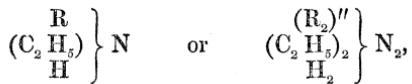
In former parts of this inquiry I have had repeated opportunities of discussing the features of distinction between the monamines and diamines. I have shown that the study of the genesis and of the transformations of an ammonia, and the observation of its boiling-point supply most valuable data for the elucidation of this question; and that the most reliable inferences may be drawn from the determination of its vapour-density.

In continuing my experiments upon this subject, I have been led to the discovery of a class of salts, the formation of which decides the question in an equally satisfactory manner.

Let us imagine an ammonia of uncertain origin, the composition and degree of substitution of which has been experimentally determined. It is obvious that as long as the boiling-point, and more particularly the vapour-density, remain unascertained, it is left doubtful whether the molecular value of the new compound is represented by

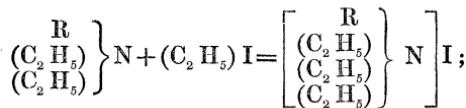


Nor is this doubt removed by the formation of ammonias of more advanced substitution. I have never succeeded in limiting the substitution to one equivalent of hydrogen in the case of diamines; the residual hydrogen in each of the linked ammonia-molecules is invariably affected in the same manner. Thus the action of iodide of ethyl upon the ammonia under consideration will produce two volatile bases,—

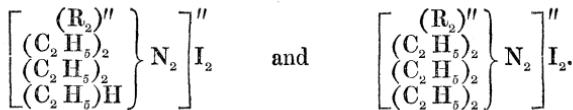


the atomicity of which is as uncertain as that of the body from which they are derived.

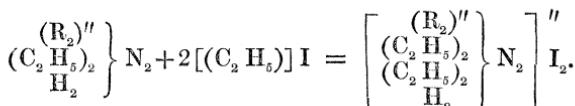
It is in the transformation of the ammonia into an ammonium-compound by the action of iodide of ethyl that the true nature of the substance is revealed. A monamine, thus treated, yields only *one* compound,



whilst a diamine gives rise to *two* compounds, viz.:—

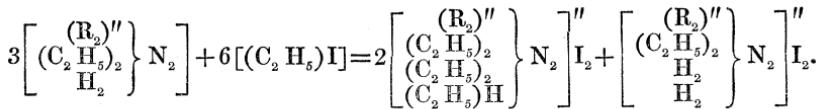


The first of these compounds is always formed when the secondary diamine is submitted to the action of iodide of ethyl. In this case two independent reactions are accomplished side by side. The first one transforms the diethylated diamine into a tetrethylated diammonium-compound,

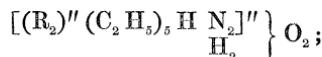
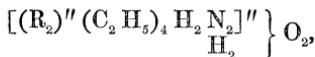
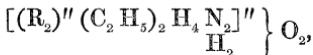


The second reaction gives rise to a *pentethylated* diammonium-

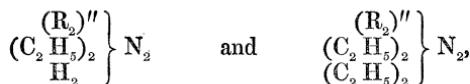
compound, while the iodide of the *diethylated* diammonium is reproduced,



Treatment of these mixed iodides with oxide of silver yields an alkaline solution containing the three bases—



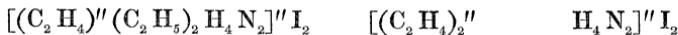
the two former of which, being capable of conversion into the volatile diamines



may be expelled from the solution by a current of steam, the non-volatile pentethylated diammonium-compound being left behind.

Treated again with iodide of ethyl, the pentethylated compound, lastly, is converted into the di-iodide of the hexethylated diammonium. *The formation of the pentethylated derivative establishes the diatomic character of the ammonia under examination.*

I have studied several non-volatile bases, retaining one equivalent of unreplaced hydrogen. The derivatives of the ethylene-ammonias deserve more particularly to be mentioned. Ethylene-diamine and diethylene-diamine, when submitted to the action of iodide of ethyl, give rise to the following series of compounds:—



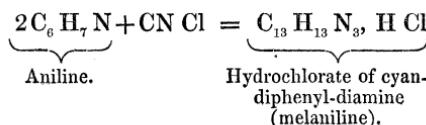
The diatomic nature of ethylene-diamine and diethylene-diamine is

sufficiently well established by their origin, and by the determination of their boiling-points and vapour-densities; so that the examination of non-volatile bases, retaining one equivalent of unreplaced hydrogen, is not necessary for the elucidation of their atomicity—affording simply additional evidence in favour of facts otherwise satisfactorily proved. But it is obvious how, in the case of compounds of uncertain origin, which may be easily decomposable or difficultly accessible, the formation of this class of salts must facilitate the diagnosis of the diamines, and may, under certain conditions, become the principal criterion for ascertaining the atomicity of an ammonia.

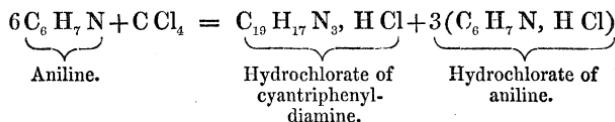
XIII. "Notes of Researches on the Poly-Ammonias."—No.

XV. Monacid Polyamines. By A. W. HOFMANN, LL.D.,
F.R.S. Received June 13, 1861.

In former investigations I have pointed out the existence of a group of monacid bases containing three equivalents of nitrogen, the principal representatives of which, cyanodiphenyldiamine and cyanetriphenyldiamine, were formed by submitting aniline to the action respectively of chloride of cyanogen *,



and tetrachloride of carbon,



I have lately met again with this group of bases in a new reaction which I beg leave to submit to the Royal Society.

When examining several years ago † the action of ethylate of sodium upon cyanate of ethyl, I observed the formation of triethylamine, but in subsequent experiments ‡ I could not reproduce this compound by

* H = 1; O = 16; C = 12, &c.

† Proceedings of the Royal Society, vol. viii. p. 489.

‡ Journal of the Chemical Society, vol. xiii. p. 70.